Dantherm®
CONTROL YOUR CLIMATE

Air Conditioner 4000

Service manual
Rev. 1.1
en

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Introduction

Overview

Introduction

This is the service manual for the Dantherm Air Conditioner 4000 series.
Please see the below table of content for further information about the sections.

Target group

This service manual is designed for technicians who install and maintain the Air Conditioner, as well as the users of the unit

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Reservations

Dantherm reserves the right to make changes and improvements to the product and the service manual at any time without prior notice or obligation.

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Dantherm n'assume aucune responsabilité pour erreurs et modifications éventuelles

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Warning

Introduction

This installation manual and the product use various displays and labels to ensure safe use. Failure to follow these instructions could result in injury, death or damage to equipment. Ignoring these displays and labels and incorrectly using the product could have results as classified below.

Please read the following warning symbol information before reading the rest of this section, and be sure to strictly observe all instructions.

General precaution

This product is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the product by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the product.

If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified person in order to avoid a hazard.

Failure to follow these instructions could result in death or serious injury

Failure to follow these instructions could result in injury or property damage.

This symbol means something that should NOT be done

Project safety is your responsibility!

Follow the instructions in this manual regarding the installation method and installation orientation. All work should be performed by qualified personal using safe work practices.

All proper personal protective equipment should be used. PPE required for this installation includes, but is not limited to:

- Safety glasses
- Hard hat
- Safety shoes
- Hearing protection
- Cut resistant gloves
- Face shield
- Proper work attire (long sleeve shirt and long pants)

Please strictly observe the following: Special Skill is required to install the Dantherm products. Non-qualified personnel should not attempt any of the actions shown in this installation guide. Dantherm shall not be responsible for improper installation or any accidents, damage, or injury resulting from improper installation.

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Product description

Overall description

Introduction

This section describes the overall product and its functionality

The Air Conditioner is designed to control the internal temperature of an outdoor enclosure. The Air Conditioner removes dissipated heat from electronic equipment and is designed to maintain correct temperature for electronic equipment.

Model overview

This manual covers a series of air conditioners. Models available are:

Enclosure size inch	Cooling capacity/ btu	Heater power /watt	Voltage / frequency	External over current protection / A	Minimum supply cord dimension
H*W*D 29 -17.3-11.3	4000	1000	115V/60Hz	C20A	AWG 14
			230V/50-60hz	C10A	

Available accessories

This table shows the accessories available from supplier

No	Description
707585	Air Filter, A/C 4000
707600	Crankcase heater 115V
707601	Crankcase heater 230V

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Overall description, continued

Outdoor view

This illustrates the unit's outdoor view:

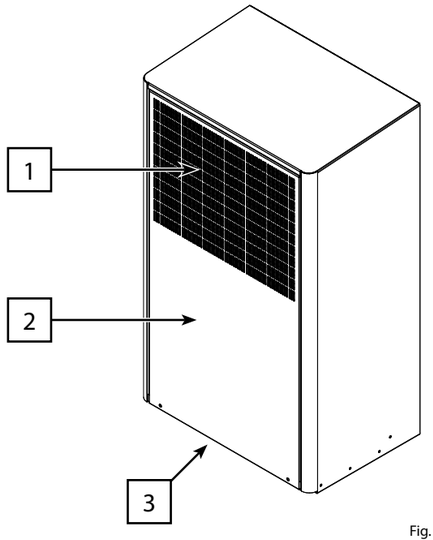

Fig. 1

Outdoor part description

The table shows the part description for the outdoor parts shown in Fig. 1:

Part	Description
1	Condenser air outlet
2	Removable front cover
3	Condenser Air inlet

Drainage

This air conditioner includes a condensate drain in the bottom of the unit which routes condensed water away from the unit..

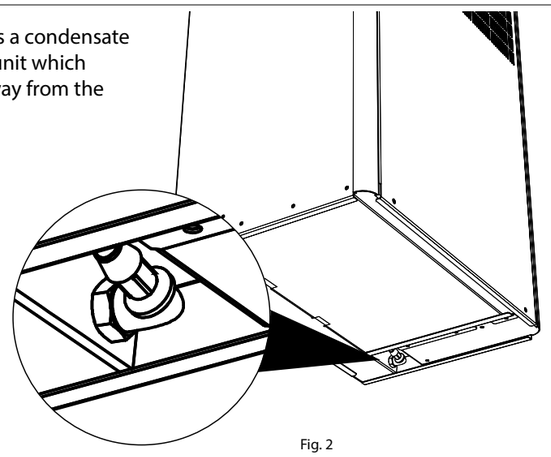

Fig. 2

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Overall description, continued

Introduction

This illustrates the unit's indoor view:

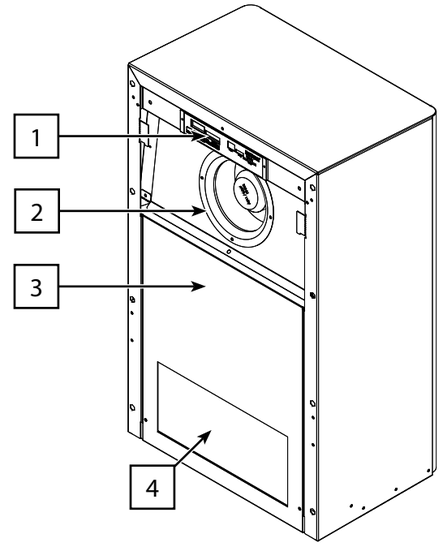

Fig. 3

Indoor part description

The table shows the part description for the indoor parts shown in Fig. 3:

Part	Description
1	Internal cooling controller
2	Evaporator fan
3	Removable front cover
4	Evaporator outlet

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Overall description, continued

Functionallity

The illustration and table below show the airflow of the Air conditioner. The two air flows (internal/external) operate separately. External air is only used to cool down the condenser which dissipates the heat absorbed by the indoor evaporator. The air flows are not mixed.

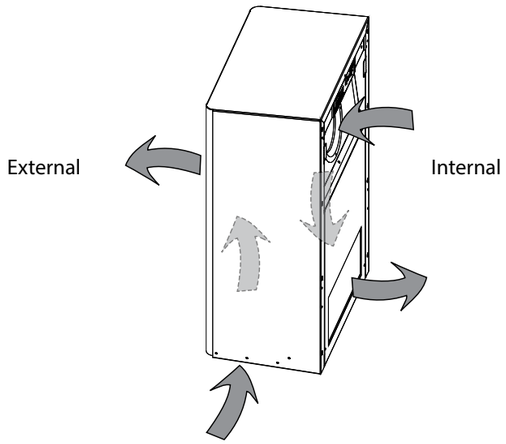

Fig. 4

Internal air flow

Warm, internal air is drawn into the unit by the internal evaporator fan, through the evaporator, and then released into the enclosure, through the evaporator opening.

External air flow

Cold, external air is drawn into the unit by the condenser fan, and routed through the condenser, where it is cooling down the condenser. The air is returned to the external environment after it passes through the condenser.

Filters

The external air inlet in the bottom of the unit, has an optional pre-filter. This will reduce the instrusion of leaves or bugs in the air inlet.
The slide track in the bottom of the unit allows the user to slide in the pre-filter.

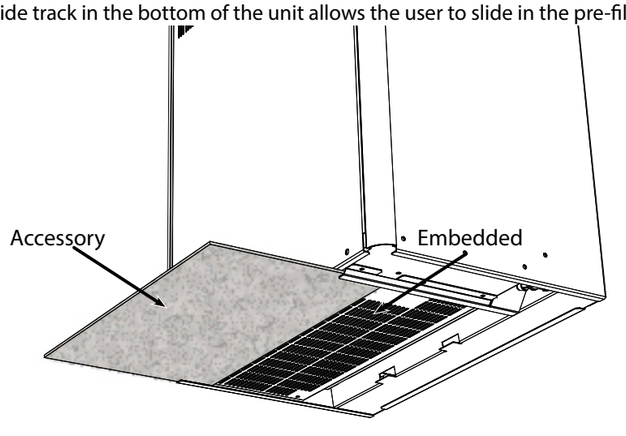

Fig. 5

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Electronic control description

Introduction

This section describes key features of the electronic control and how it operates.

Warning

Never perform installation, maintenance or service, without disconnecting the AC power supply.

Embedded Controller

Basic parameters of the built- in controller can be set via the on board control panel from inside the unit. See more in operation section page 12.
Extended parameter settings, as well as logging of operation data, is possible through the SD card interface.

Control strategy

The controller controls the fans, heater, and cooling compressor according to the temperature in return air flow.

- At power up, the controller will initiate a self test procedure for a few seconds.
- During operation, the evaporator fan will repeatedly circulate the indoor air.
- The compressor will start when the temperature is higher than the setpoint, which then initiates cooling.
- Then compressor stops at setpoint.
- The high temperature alarm will initiate an alarm on the alarm output when the temp is higher than 60° C.
- The low temperature alarm will initiate an alarm on the alarm output when the temp is lower than 1° C.
- The condenser fan operates only when the actual temperature on the condenser surface requires this.

Alarm connection options can be found on page 11.

Operation panel

This illustrates the operation panel, seen from inside of the unit.

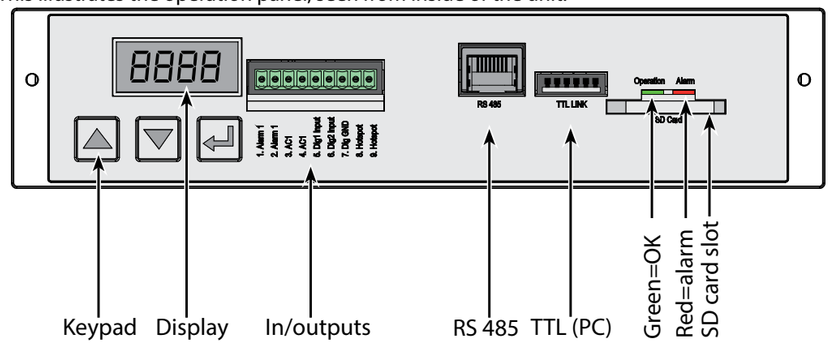

Fig. 6

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Connections

Connections illustration

This illustration shows the external connections to the controller

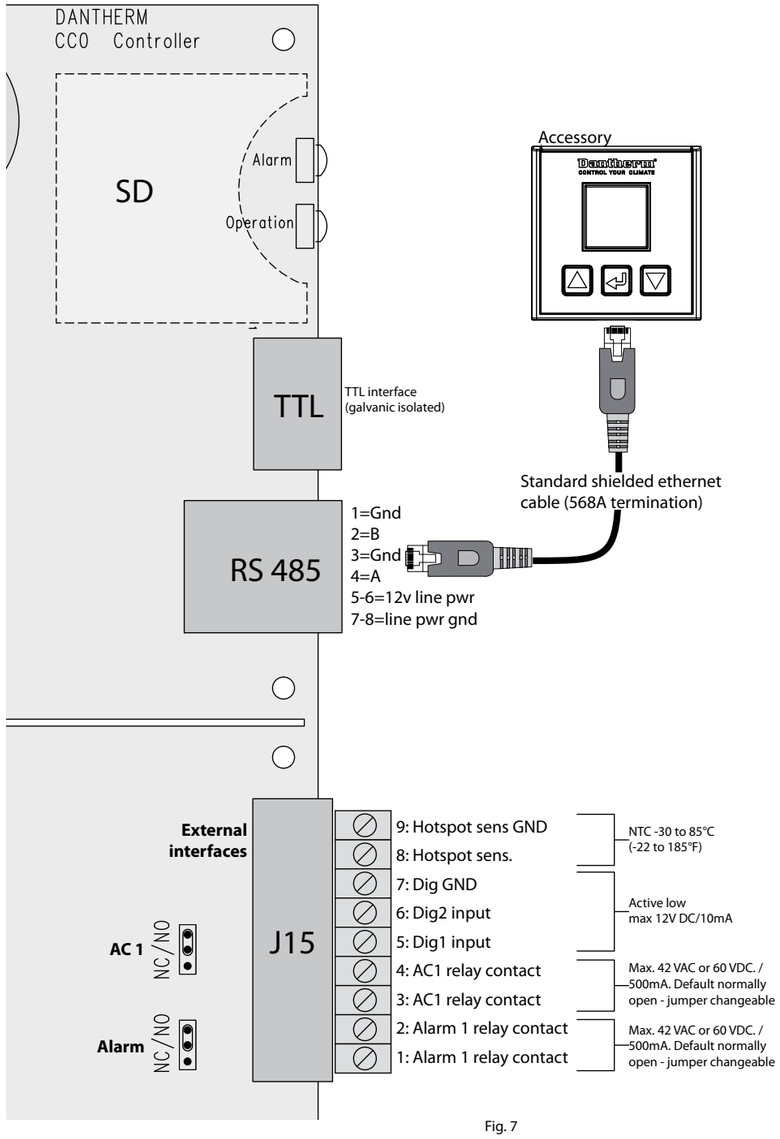

Fig. 7

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Connections, continued

The air conditioner can operate as a stand alone cooling system. For enhanced usage, it is possible to connect an external display with keypad.

See below table for options

Connection	Usage	Specification
Alarm 1	This output will toogle state open/close if any operation errors occur. Default open OR default close can be set via a jumper on the PCB. Factory setting is normally open	Potential free Max. 42 VAC or 60 VDC. / 500mA Galvanic isolated (500V)
AC 1	This output will toogle state open/close if highest temperature limit setpoint is exceeded. Default open OR default close can be set via a jumper on the PCB. Factory setting is normally open	Potential free Max. 42 VAC or 60 VDC. / 500mA Galvanic isolated (500V)
Digital input 1	This input can control and overrule some operation parameters. See more in the parameters list Active when low (0V)	0/12V DC Internal pull up Max. 10mA
Digital input 2	This input can control and overrule some operation parameters. See more in the parameters list Active when low (0V)	0/12V DC Internal pull up Max. 10mA
Hotspot sensor	Temperature sensor for placing inside the enclosure, in a hotspot zone if required.	NTC -30 to 85°C (-22 to 185°F)

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Operation

Introduction

The unit can operate on the built in operation panel. All operation parameters are set via TTL or SD card. Cooling and heating setpoints are available in the control panel.

Key operation

The functionality on the control panel is as follows:

- Left key is step up
- Middle key is step down
- Right key is enter

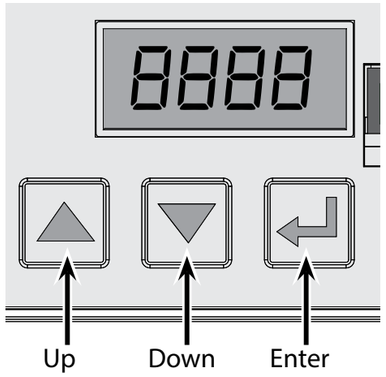

Fig. 8

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Operation, continued

Navigating menu

Menu structure and navigation. Step up/down to jump through menues, end enter to select the parameter to read or change.

Step	Actions	Display
Hibernate mode shows the actual room temperature. After 3 minutes without any activity on the keys, the controllers exits any any menu and shows this. Use up/down to select any below menu		24
CooL Cooling set-point parameter	Press enter 2 sec. and change the value followed by enter to save.	C25
Heat Heater set-point parameter	Press enter 2 sec. and change the value followed by enter to save.	H05
Err Operation error list. See complete list at section “Error list” on page 14	Press enter 2 sec. and change the readings to see if more error are present simultaneously.	E05
Test Over ride test. This will run a series of component tests. See complete list at section “Steps in test program” on page 14	Press enter 2 sec. to start the test. The test steps will increase by one after 60 seconds or be changed manually with up/down. The test will auto disable after 30 minutes, if not manually left before, with enter key	r 12

Toggle Celsius to Fahrenheit readings

In hibernate mode press and hold the Enter key for 5 seconds to toggle Celsius and Fahrenheit unit in all temperature readings.

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Operation, continued

Error list

The below table shows the meaning of each error.

Code	Error cause
1	High Volt [PHV][0/1]: 1
2	Low Volt [PLV][0/1]: 0
3	High Curr. [PIH][0/1]: 1
4	Low Curr. [PIL][0/1]: 0
5	Room Temp H/L [THL][0/1]: 1
6	Fan 1 [F1][0/1]: 0
7	Fan 2 [F2][0/1]: 1
8	DC Comp. [DCK][0/1]: 0
9	Ret Air Sens [RAS][0/1]: 1
10	Hotspot Sens [HSS][0/1]: 0
11	Evap in Sens [EIS][0/1]: 1
12	Evap out Sens [EOS][0/1]: 0
13	Cond. Sens [CDS][0/1]: 1
14	Digi.1 I/P [D1][0/1]: 0
15	Digi.2 I/P [D2][0/1]: 1
16	HP Pressure [HPE][0/1]: 0
17	DCC HeatSink [DHS][0/1]: 1
18	DCC Dig. 1 [DD1][0/1]: 0
19	DCC Dig. 2 [DD2][0/1]: 1

Steps in test program

The below table shows the steps in the self test program.

Step	Test
0	NONE
1	AC_COMPR
2	AC_1
3	AC_FAN_1
4	AC_FAN_2
5	HEATER
6	EC_FAN_1
7	EC_FAN_2
8	DC_COMPR
9	ALARM
10	EEXP_VALVE
11	SD_CARD
12	SENSOR_RETAIR
13	SENSOR_HOTSPOT
14	SENSOR_EVOPIN
15	SENSOR_EVOPOUT
16	SENSOR_COND

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Installation

Introduction

This unit is designed to be mounted outdoor, flush to the wall. No other installation method isn't recommended.

Never perform installation, maintenance or service, without disconnecting the AC power supply.

Installation placement

Any installation should allow good air flow inside the enclosure. The unit has cold temperature supply in the lower part and return air in the upper part of the unit as shown on page 8. Please consider how to achieve the best possible air flow when selecting appropriate placement.
A gaskit is included with the air conditioner unit. Additionally, we recommend the installation of polymer sealing on the exterior to prevent water instrusion

Air Con 4000 wall cut out

Please mark the cutout area and holes, according the below dimensions:

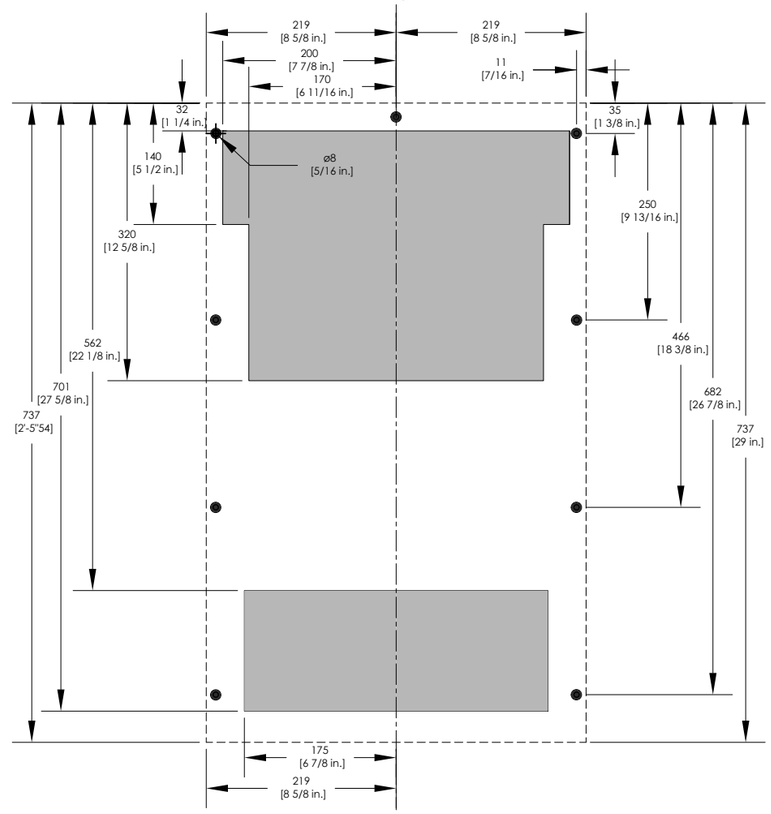

Fig. 9

Warning Cut the two openings and drill the 9 pcs. with appropriate tools (8mm / 0,315") to ensurr that no dust and debrees will accumulate into the enclosure.

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Installation, continued

Preparation

Unpack the unit and place onto a table or similar stable placement.
The unit has small sheet metal parts that must be hand bent 90° in order for it to support the unit when attaching and securing the bolts and intalling the unit permanently to the wall.
The gasket (if not already installed onto the unit) can be found in the unit packaging. This should be installed according to illustrations below.

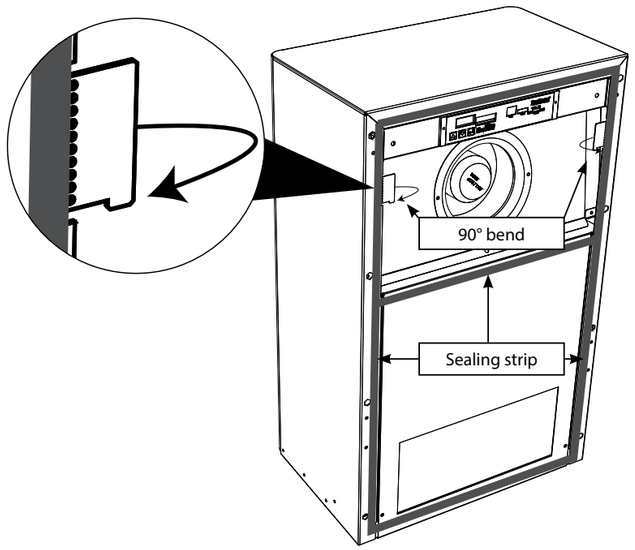

Fig. 10

Installation

Lift the unit into the cutouts and place it on the two brackets. Place the bolt from the inside, and secure them one by one, taking great care that no damage is done to the unit or enclosure due to small variation in enclosure structure.
After fastening all the bolts, the unit should be sealed on the outside, top and side junctions towards the enclosure.

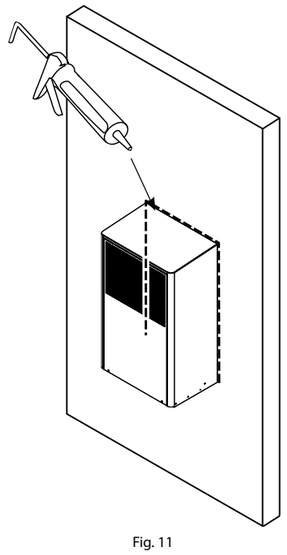

Fig. 11

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Installation, continued

Electrical requirements

Warning

Please incorporate the following imperative requirements when installing the electrical connections:

- Installation should always be in accordance with national wiring regulations.
- AC external supply should be protected with an external disconnecting device that has a contact separation of at least 3 mm. This external AC supply must also be over current protected. The disconnecting device must always be labeled with rated voltage as well as rated current.
- The unit's earth connections must always be connected to the enclosures ground.
- All cables in a permanent installation, must be installed and secured properly to prevent any damage to equipment and/or humans. Secure all cables with cable ties or appropriate cable fasteners made for this purpose.

Electrical connections

Warning

After unit installation, the electrical connections shall be completed, following below requirements:

1. The power and/or additional connections shall be routed, secured, and connected to appropriate sources. The Air Conditioner is either delivered with:

   A. 10 ft. cable with stripped wires, that shall be connected inside a distribution board.
   White lead=Neutral (L2 in 230V versions)
   Black lead= Live (L1)
   Green/yellow = Earth

   B. A unit with extension "L" on the type label, is delivered with a factory fitted plug that shall be connected to an appropriate outlet that is NOT accessible to general public .

2. If the power supply cord needs to be extended, always use at minimum, the same AWG.
3. Connect the Air Conditioner's ground terminal to enclosure grounding.
4. All power supply connections should be secured with an external disconnection device. Also ensure the connections are over current protected. The fuse specification for the referring unit type/size can be found in the model overview table on page 5.
5. Connect any accessory needed according the specification to be found in the chapter for external connections on page 11, Fig. 7.

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Service Guide

Preventative maintenance

Introduction

Preventive maintenance has to be performed in order to:

- Continue operation in specified range
- Avoid malfunctions
- Avoid inefficient operation
- Maximize the unit's lifetime

The factory warranty is only valid if documented preventive maintenance has been performed within time interval of:

- Maximum 6 months when unit is located in normal air quality environment
- Maximum 2 months when unit is located in bad quality air environment

A written log at site is adequate documentation for preventive maintenance.

CAUTION

- Switch off AC supply before working on the unit.
- Make sure that all work has been performed correctly before switching power back on.

Cleaning

The unit must be cleaned according to the recommended preventive maintenance plan.
Tools required:

- Vacuum cleaner or compressed air
- Soft brush
- TX20 screwdriver
- AC cleaning agent if it is very dirty

Phase	Description
1	Check and clean the outside air inlet grill. See page 8
2	Open the unit's outer cover by removing the two screws in the lower edge of the cover
3	Vacuum the condenser coil and the visible part of the fan
4	Vacuum the evaporator coil from the inside of the enclosure.
5	IF any of the coils are still dirty, please apply AC cleaning agent on coil fins, and after 5 minutes, rinse gently with water WITHOUT spraying water on any electrical parts.
6	Perform end inspection according to the list in next section.

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Preventative maintenance, continued

Inspection

The unit must be inspected prior to any re-assembly and put back into service. Please follow below steps:

Phase	Description
1	Are the fans clean and free of any corrosion?
2	Are the coolant pipes free of obstructions, damage, corrosion and show no obvious signs of leakage?
3	Are the coil lamellars clean and undamaged?
4	Are all fan blades free of any obstructions, cracks or missing blades?
5	When rotating the fans with the fingers, do the fans rotate freely without vibrations and noise?
6	Is all wiring and insulation undamaged?
7	Are all connectors secured properly and in good condition?
8	Inspect the drain hose (if any) for damages.
9	Are any alarms visible on the controller? See page 9

Test cooling circuit

The cooling circuit is designed for long durability, and is comprised of a few components.
Any test of the circuit should be conducted **only if a relevant problem has arisen.**
Open the unit outside cover by removing the two screws in the lower part.
Locate the service valve and connect a pressure gauge. Confirm that the pressure is aligned with the present temperature according the read pressure.
Please be aware that with very low amount of refrigerant, its critical to use short hoses to the pressure gauge meter.

Test safety shut down

The compressor's safety switch (Klixon) can be tested manually. Make sure that the unit's cooling circuit is working before initiating this test.
Cover the condenser air inlet in the bottom of the outer cabinet with a piece of plastic or something similar. Bring the unit into continuous operation (lower setpoint inside the shelter), and expect shut down within a maximum one hour. If not, the switch is not working.

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Spare parts

Illustration, external parts Below illustration shows the available spare parts for the condenser section of the unit.

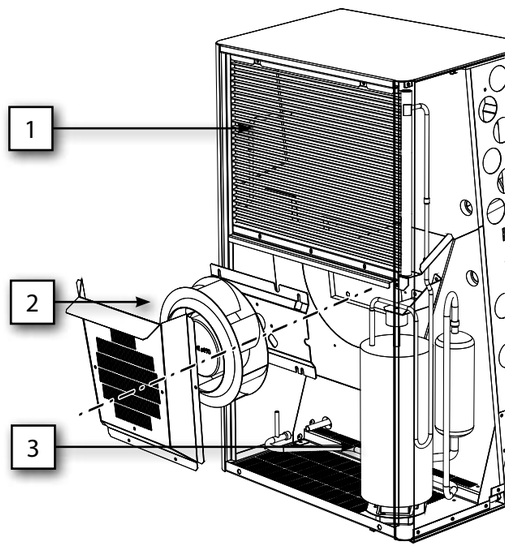

Fig. 12

Sparepart list External This list shows available spare parts for the condenser section of the unit.

Pos.	Number	Description
1	081943	Coil, Compressor, A/C 4000
2	085842	Compressor, **115V**
	707600	Crankcase Heater, 25W, **115V**
2	707595	Compressor & hardware, **230V**
	707601	Crankcase Heater, 25W, **230V**
	707589	Compressor Electrical Harness, New 4K
3	219389	Fan, **115V**
3	219387	Fan, **230V**
	707594	Screw, M6 x 25, HEX Head, SS
	298043	Washer, 1/4", Flat, SS
	298044	Washer, 1/4", Spring Lock, SS
	707617	Gasket Kit, A/C 4000 Mounting
	430651	Danaseal
	705842	NAMEPLATE MATERIAL, rev.b

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Spare parts, continued

Illustration, internal parts Below illustration shows the available spare parts for the evaporator section of the unit.

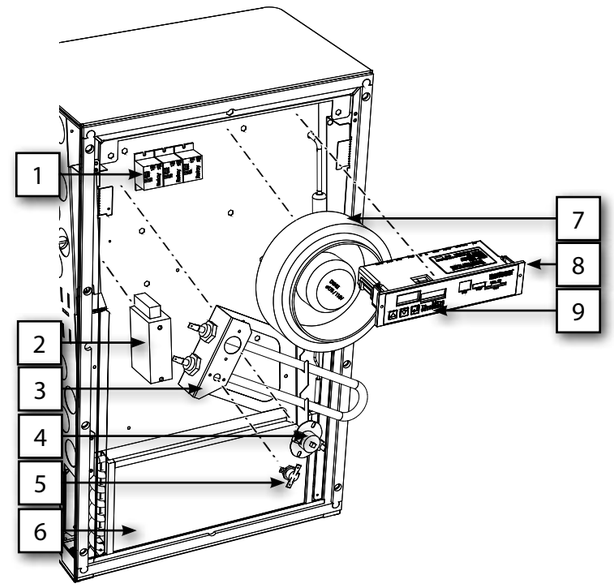

Fig. 13

Sparepart list Internal This list shows available spare parts for the evaporator section of the unit.

Pos.	Number	Description
1	084215	Relay, 40A. 12V coil
	707590	Relay Electrical Harness, New 4K
2	084214	Power supply, 12VDC, 15W
	707591	Power Supply Elec Harness, New 4K
3	086473	Heater Element, 1000W, **115VAC**
	086474	Heater Element, 1000W, **230VAC**
4	298681	Thermostat, temp limiting, manual reset, open 170F
5	707605	Thermostat, Automatic Reset, 140F
6	081942	Coil, Evaporator, A/C 4000
7	219388	Fan, **115V**
	219386	Fan, **230V**
8	085926	CC0 Assembly with Housing and Overlay
9	707634	Plug, Terminal Block, CC0 External Connections

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Technical data

Introduction

These units are designed for high reliability and electrical efficiency.

- Compressor is a rotary type with high efficiency.
- Radial fans with backward curved impellers.
- Slim MPE Condenser for high performance thus low pressure drop.

4000 btu. units

This table shows the technical data for 4000 BTU models.

Specification	Unit	115 VAC units	230 VAC units
Unit dimensions (height×width×depth)	Inch.	29 x 17.3 x 11.3	
Weight	lbs.	70	
Operational temperature range	°F	-40-+131	
Storage temperature / humidity	°F /RH%	-40-+176 / 0-99	
Noise level, outside 2m distance at 80.6°F. internal / 95°F. Ambient	dB(A)		65
IP protection EN 60529	IP class		65
Outdoor Enclosure acc. UL 50			Type 3R
Refrigerant type / amount	Type/lbs		R134a /210g
Cooling capacity at 80.6°F internal/95°F Ambient (total)	BTU/h		4092
EER Air conditioning at 95°F internal / 95°F Ambient	BTU/h		5.2
Internal airflow	CFM		679
External airflow	CFM		798
Input voltage range	VAC	115 +/-10%	230 +/-10%
Frequency	Hz	60	50/60
Power consumption Circulation / Air Conditioning	W		48/740
Power consumption Heater	W	1000	1000
LRA (locked rotor current)*	A	37*	17*
Extension cord dimension	awg	14	14

*Recommended over current protection specification to be found on page 5

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Electrical schematics

Overall controller

This illustration shows the complete controller connections, internal as well as external:

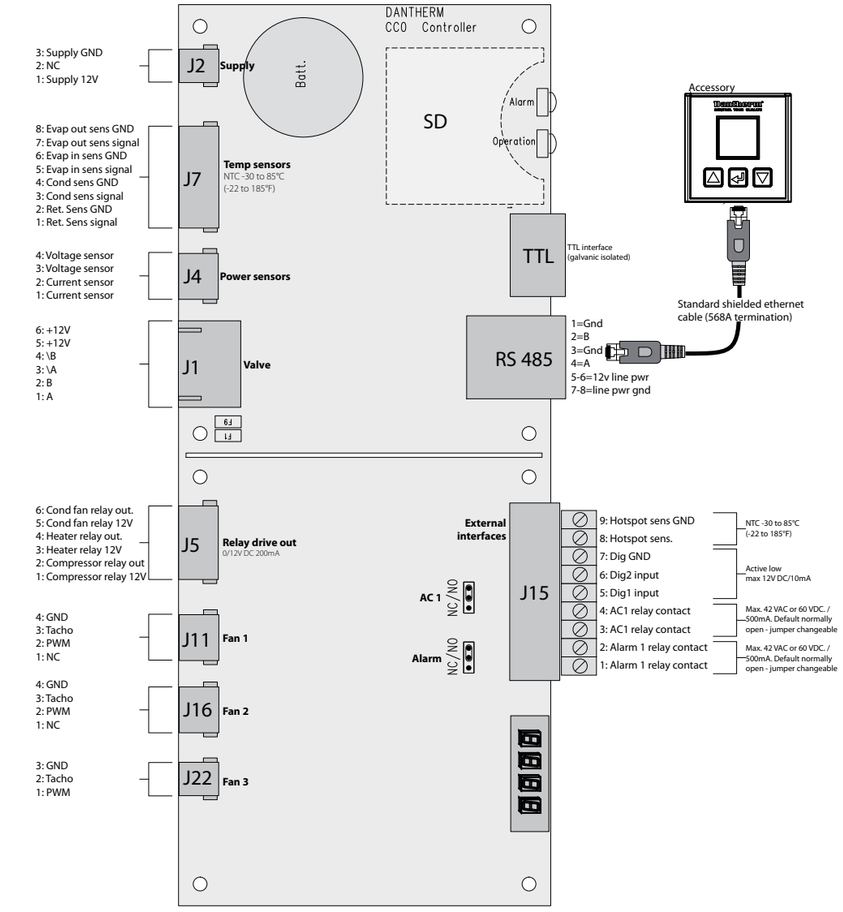

Fig. 14

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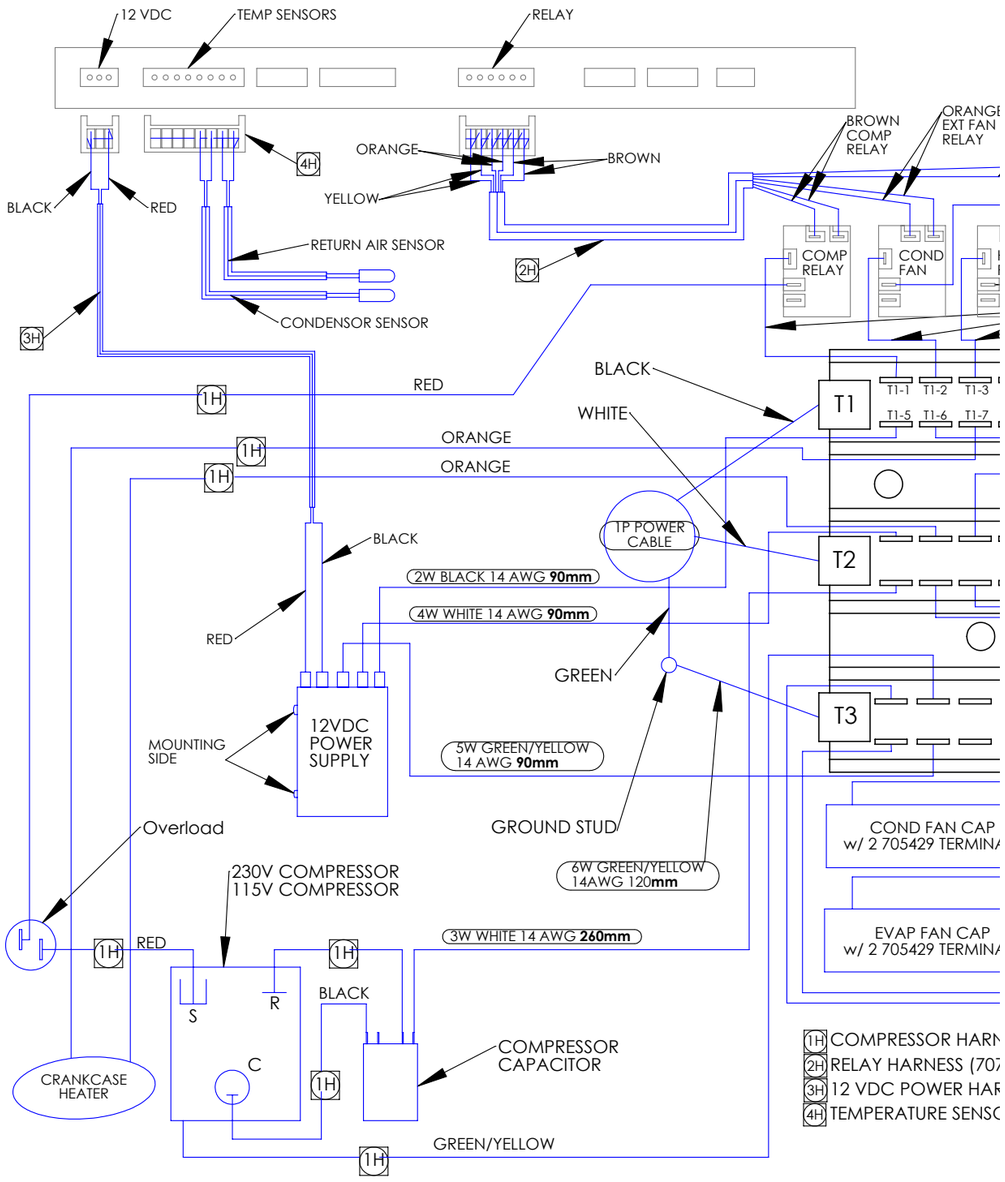
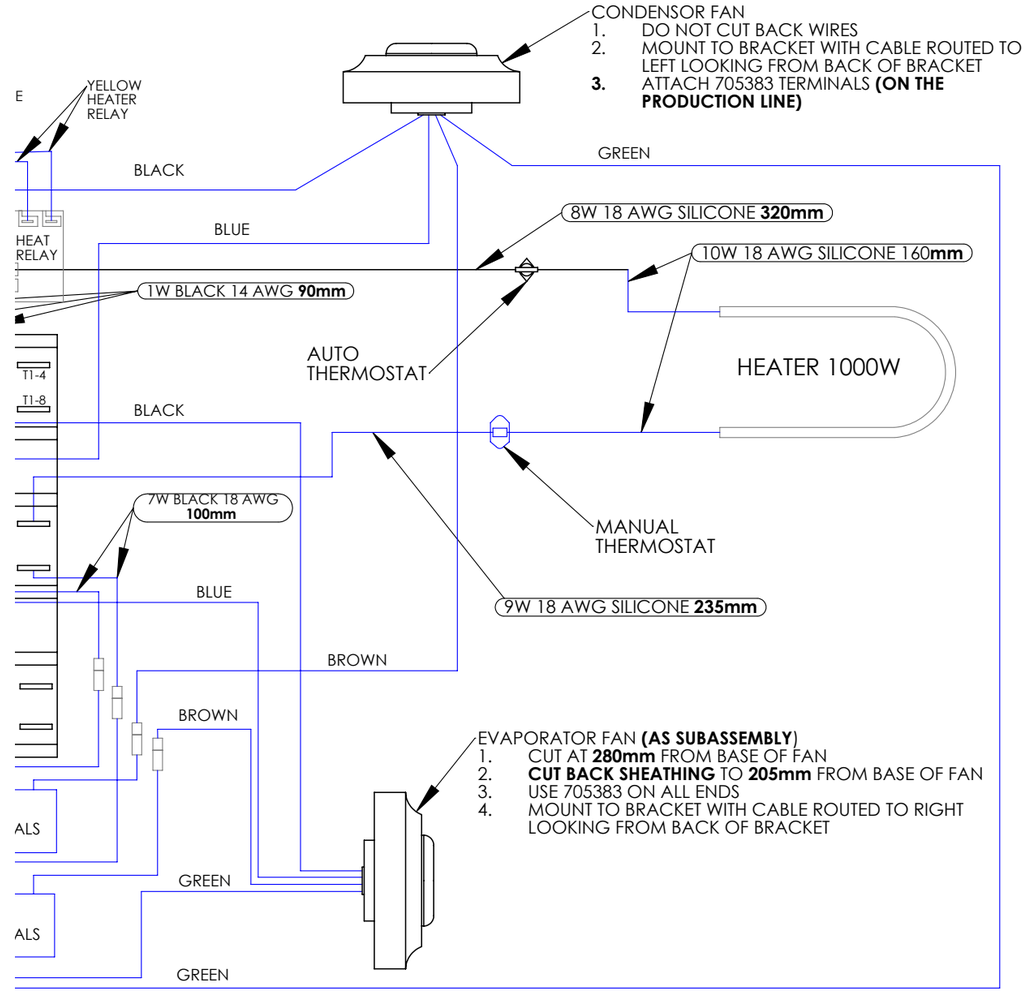
Electrical schematics, continued

Unit schematics This illustration shows the unit's schematics.:





NESS (707589)
7590)
RNESS (707591)
OR HARNESS

Fig. 15

Warning Any power supply shall be over current protected according table on page 5

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Electrical schematics, continued

Unit schematics

This illustration shows the units schematics:

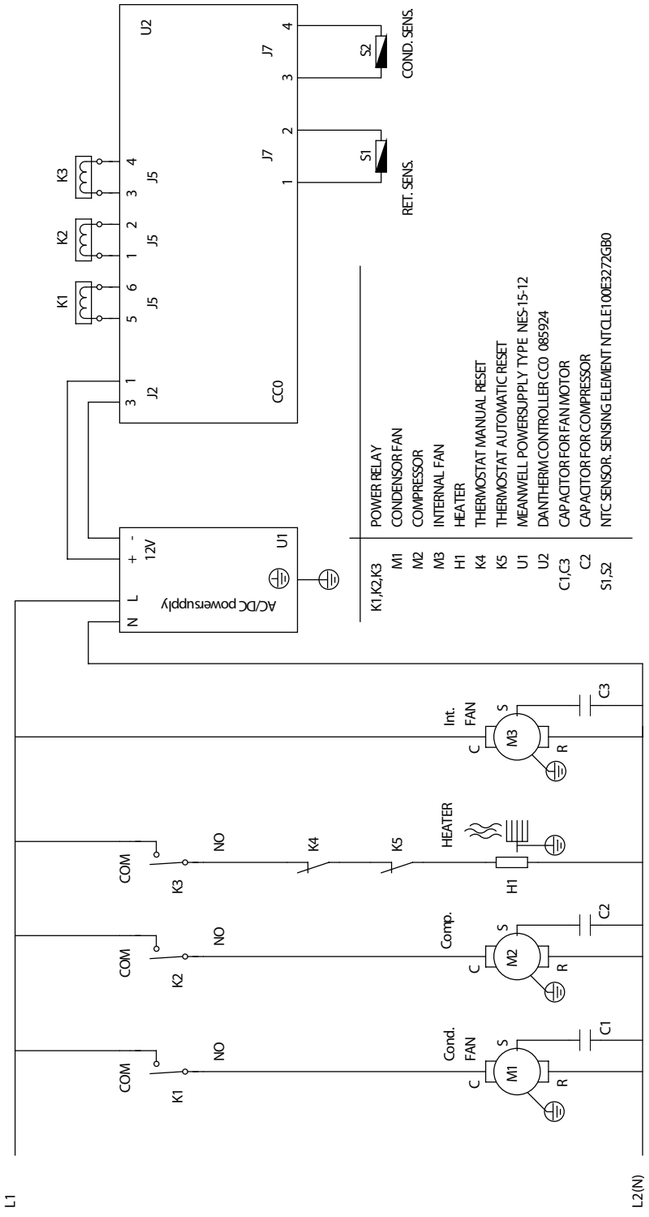

Fig. 16

Cooling schematic

Introduction

This illustration shows the cooling circuit schematic.

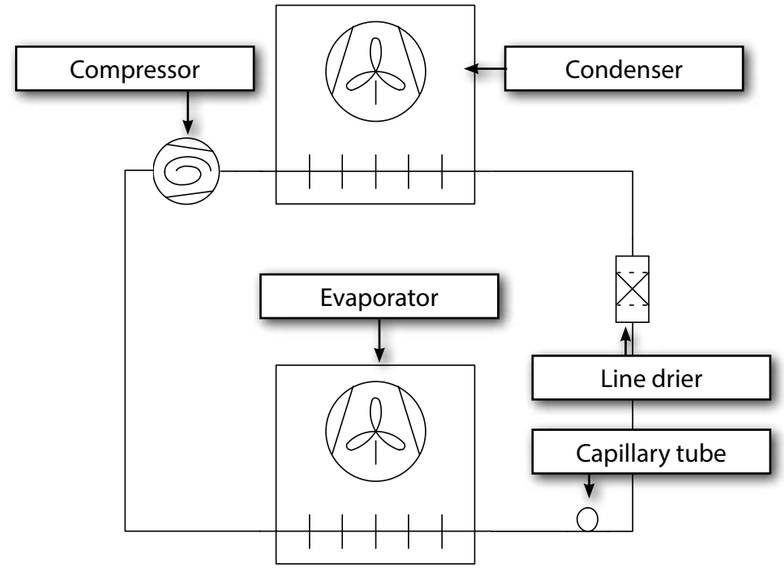

Fig. 17

Fig. 17

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Declaration of conformity

Declaration of Conformity

CE

Dantherm Air Handling A/S, Marienlystvej 65, DK-7800 Skive hereby declare that the Air Conditioners are in conformity with the following directives:

UL 60335-1 . . . . . Fifth Edition
UL 60335-2-40. . . . . First Edition
CAN/CSA-C22.2 No. 60335-1-11 . . First Edition
CAN/CSA-C22.2 No. 60335-2-40 . . First Edition

Skive, 10.06.2014

Recycling

The unit should be recycled according to national rules and procedures to protect the environment. Please consult your local authorities for further information.

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